WEB MAP SERVICE (WMS) FOR GEOLOGICAL DATA

GEORGE TUDOR
WEB MAP SERVICE (WMS) - GENERALITIES

• Projects with data from different sources
• Geological data are in different GIS software format
• Large amount of working for data conversion, integration and reproduction of data
• Difficulty to update data from other institutions
WEB MAP SERVICE (WMS) - GENERALITIES

• **Standard protocol** for serving georeferenced map images over the internet that are generated by a map server using data from a GIS database

• The specification was developed and first published by the **Open Geospatial Consortium (OGC)** in 1999 – an international voluntary standard organization, for open standards for geospatial content and services, GIS data processing and data sharing
WEB MAP SERVICE (WMS) - GENERALITIES

- **WMS** (Web Map Service) returns GIS data as image

- **WFS** (Web Feature Service) returns feature data (vector data) – use XML – based on GML format

- **WCS** (Web Coverage Service) returns coverage data, especially as raster data
WEB MAP SERVICE (WMS)

SERVER SIDE

GIS DATA

GIR GIS DATABASE

REQUEST

GEOFERRENCEED IMAGES FROM VECTOR DATA

MAP SERVER

REQUEST

HTTP PROTOCOL

WEB SERVER

RETURN

HTML OUTPUT

PICTURE OUTPUT

CLIENT SIDE

GEOFERRENCEED IMAGES

WEB BROWSER

DESKTOP GIS

REQUEST

RETURN

INTERNET

GEOLOGICAL GIS DATA LAYERS (lithology, geological limits, mineral resources)

GIS DATA

GIS SERVER SOFTWARE (MapServer, GeoServer, ArcGIS Server)

WEB SERVER SOFTWARE (Apache, IIS, etc)

Web browser software (Internet Explorer, Firefox, Opera, Chrome, etc)

ArcGIS, QuantumGIS
WEB MAP SERVICE (WMS) - REQUESTS

A WMS-compliant server must be able to handle at least the following 3 types of WMS requests:

• **GetCapabilities**: return an XML document with metadata of the information

• **GetMap**: return an image of a map according to the user's needs.

• **GetFeatureInfo**: return info about feature(s) at a query (mouse click) location.
WEB MAP SERVICE (WMS) – URL AND COMMANDS

WMS address:
- http://37.128.225.60/ArcGIS_Server_IGR/services/GIR_Bedrock_and_Superficial_Lithostratigraphy/MapServer/WMSServer?

WMS request for Capabilities
- http://37.128.225.60/ArcGIS_Server_IGR/services/GIR_Bedrock_and_Superficial_Lithostratigraphy/MapServer/WMSServer?service=wms&request=GetCapabilities&version=1.3.0
WMS FOR MAPSERVER (OPEN SOURCE TECHNOLOGY)

MAPSERVER

CGI-REQUEST

PICTURE OUTPUT

WEB SERVER

APPLICATIONS

Apache Server

RUN /mapserv.exe/*.map, parameters

GIF, PNG, JPEG. BMP. SWF, GTIFF

MAP FILE
HTML TEMPLATE

INTERNET

GETMAP, GETCAPABILITIES
GETMAPINFO

WEB BROWSERS
GIS DESKTOP

CLIENT

GIS DATABASE

SPATIAL DATABASE

SQL DATABASE

Internal database: vector, raster: External database: WMS, WFS
Map file

- A map file is a simple text file used by MapServer to configure various features of maps (layers, colors, symbols, labels, etc).
- It is composed by hierarchical objects, which start with a specific keyword (MAP, WEB, etc) and finish with the keyboard END:
  Map, Web, Layer, Class, Projection, Legend, Metadata, OutputFormat
# Start of map file
# MAP
NAME GIR_RO_Bedrock_and_Superficial_Geology #Root layer name
STATUS ON
SIZE 600 600
EXTENT 134649.999723 233779.998862 868460.000278 752129.999473 #Change to appropriate coordinates for your data
UNITS meters # UNITS [feet|inches|kilometers|meters|miles|dd] Units of the map coordinates. Used for scalebar and scale computations.
SHAPEPATH "data"
IMAGECOLOR 255 255 255

OUTPUTFORMAT
NAME png
DRIVER "GD/PNG"
MIMETYPE "image/png"
IMAGEMODE RGBA #All colours and alpha based transparency
EXTENSION "png"
FORMATOPTION "INTERLACE=ON"
#####Slow connections will profit from this option
END

# If you know you have fewer than 256 colours there may be a small decrease
# in image sizes if you use the below (default) OUTPUTFORMAT settings rather
# than those above.
# OUTPUTFORMAT
#   NAME png
#   DRIVER "GD/PNG"
#   MIMETYPE "image/png"
#   IMAGEMODE PC256
#   EXTENSION "png"
#   Only 256 colours, may be insufficient for geological maps.
# END
Editing GIR_Bedrock_and_Superficial_Lithostratigraphy

Select and configure capabilities

- Mapping (always enabled)
- Feature Access
- Mobile Data Access
- WMS
- KML
- Network Analysis
- WFS

Enter service properties below or Use External capabilities files

Name: GIR_Bedrock_and_Superficial_Lithostratigraphy
Title: GIR_Bedrock_and_Superficial_Lithostratigraphy
Abstract: The 1:1M geological map
Keyword: ArcGIS_Geospatial
OnlineResource: http://37.128.225.60/ArcGIS_Services/
ContactPerson: George Tudor
ContactPosition: Scientific Researcher
ContactOrganization: Geological Survey of Romania
AddressType: postal
Address: Călărași St, 1, Bucharest, Romania
City: Bucharest
StateOrProvince: S 1
SLD Path or URL: 

Save and Restart  Cancel
This XML file does not appear to have any style information associated with it. The document tree is shown below.

```xml
<WMS_Capabilities version="1.3.0" xsi:schemaLocation="http://www.opengis.net/wms http://schemas.opengis.net/wms/1.3.0/capabilities_1_3_0.xsd http://www.esri.com/wms http://37.128.225.60/ArcGIS_Server_IGR/services/GIR_Bedrock_and_Superficial_Lithostratigraphy/MapServer/WMSServer?service=WMS&request=GetCapabilities&version=1.3.0">
  <Service>
    <Name>WMS</Name>
    <Title>GIR_Bedrock_and_Superficial_Lithostratigraphy</Title>
  </Service>
  <Abstract>
    The 1.1M geological map data covering the whole of the Romania is available in this OGC WMS service for your personal, non-commercial use only and is being served as a contribution to the OneGeology initiative (www.onegeology.org).
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  </ContactInformation>
</WMS_Capabilities>
```
WMS FOR ARCGIS SERVER – PRINTED GEOLOGICAL MAP AT 200K SCALE
ONEGEOLOGY

A project to make web-accessible the best available geological map data worldwide at a scale of about 1:1,000,000, as a Geological Survey contribution.

WEB APPLICATION PORTAL
http://portal.onegeology.org

GEOLOGICAL SURVEY’S SERVERS

SERVICES

WMS
WFS

ONEGEOLOGY PORTAL DISPLAY ALL MAPS

GEOLOGICAL SURVEY’S

GEOPLICATIONAL CAL SURVEY’S

255 WMS AND 24 WFS
ONEGEOLOGY GeoSciML

GeoSciML – a standard schema for geological data, an extension of GML (Geography Markup Language)

GeoSciML Data Model, as a series of class diagrams with properties and relationships between geological features (unit types, age, composition, metamorphism, vocabularies, etc)

Interoperability

- semantic
  - Data Content (Ontologies, Vocabularies)

- schematic
  - Data Structure (GeoSciML, Earth Resources ML)

- syntax
  - Data Language (GML, XML) – delivers the model to web services

- systems
  - Data Services (WMS, WFS, WCS)
ONEGEOLOGY GeoSciML

GeoSciML – a standard schema for geological data

GEOLOGICAL SURVEY

GS1
GS2
GSn

SCHEMA
SCHEMA
SCHEMA

WMS, WFS
WMS, WFS
WMS, WFS

GML CLIENT

IUGS – International Union of Geological Sciences
CGI – Commission for the Management and Application of Geoscience Information
IWG – Interoperability Working Group
Multi-lingual thesaurus working group
WMS FOR ONEGEOLGY PROJECT

OneGeology Portal

Making Geological Map Data for the Earth Accessible

Overview Map

Go to

View layers

Active Layers Properties

Catalogue of Registered Services
Metadata Catalogue
Vocabularies
Help
Language

All data are owned by OneGeology participants and any limits on the use of these data are described by each provider in the Catalogue of Registered Services. This application now supports Firefox 3 and Firefox 4, IE6, IE7 and IE8, Opera, Safari, Chrome.
ONEGEOLOGY THE BASIC FUNCTIONS OF THE PORTAL

• NAVIGATION: ZOOM, PAN, GET INFORMATION TOOL
• HELP MENU
• MULTI-LAYER MAP VIEW
• OPACITY SELECTION
• LEGEND VIEWER
• LINK TO GOOGLE EARTH
• DETAILS OF GEOLOGICAL SURVEY
• BRIEF DESCRIPTION OF DATA LAYER
• CONDITIONS OF USE INFORMATION FOR EACH LAYER
• AVAILABLE IN 2 LANGUAGES
• LAYERS MANAGEMENT
• PRINT
• LOAD KML
• OVERVIEW MAP
• METADATA
• VOCABULARIES
• CATALOG OF SERVICES/MAPS
### WMS FOR ONEGEOLOGY - LAYERS

**OneGeology Portal**

*Making Geological Map Data for the Earth Accessible*

**View layers**

- **Europe**
  - **Germany**
    - DEU BGR 1:1M Geologische Einheiten, traditionelle Darstellung
  - **Luxembourg**
  - **Netherlands**
  - **Switzerland**

- **Latin America**
  - **Caribbean**
  - **South America**
    - **Andes**
    - **Argentina**
      - ARG SEGEMAR 1:5M Superficial Geology
    - **Brazil**
      - BRA GSB 1:1M Bedrock Age
      - BRA GSB 1:1M Bedrock Lithology
      - BRA GSB 1:1M Bedrock Lithosratigraphy
      - BRA GSB 1:1M Environmental Geology
      - BRA GSB EN 1:1M Bedrock Age
      - BRA GSB EN 1:1M Bedrock Lithology
      - BRA GSB EN 1:1M Bedrock Lithosratigraphy
    - **Chile**
    - **Falkland Islands (Malvinas)**
    - **Peru**
      - PER INEGEMMET 1:1M Fallas
    - **Suriname**

- **North America**
  - **North America USGS 1:5M Geology**
**WMS FOR ONEGEOLOGY – GetCapability - METADATA**

GeoNetwork - The portal to spatial data and information - Mozilla Firefox

GeoNetwork - The portal to spatial data...

[Image of a computer screen showing a webpage]

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**Identification Info**

**Title:** ROU IGR 1:1M Bedrock Lithostratigraphy for Romania  
**Date:** 2012-08-13T09:12:58  
**Revision:** Date identifies when the resource was examined or re-examined and improved or amended

Bedrock lithostratigraphy is a layer which includes bedrock and superficial rocks like geological formations from 1:1,000,000 scale geological map of Romania, in a lithostratigraphical mode. This is available in this OGC WMS service for your personal, non-commercial use only and is being served as a contribution to the OneGeology initiative (www.onegeology.org).

**Completed:** Production of the data has been completed

**Point of contact**

<table>
<thead>
<tr>
<th>Individual name</th>
<th>George Tudor</th>
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<tbody>
<tr>
<td>Organisation name</td>
<td>Geological Survey of Romania</td>
</tr>
<tr>
<td>Position name</td>
<td>Scientific Researcher</td>
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**Role:** Party who can be contacted for acquiring knowledge about or acquisition of the resource

<table>
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<tr>
<th>Voice</th>
<th>+40 (0)21 3060416</th>
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<tr>
<td>Facsimile</td>
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<tr>
<td>Delivery point</td>
<td>Cârămăşeni St, 1</td>
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**Related service metadata:**

- GIR_Bedrock and Superficial Lithostratigraphy
WMS FOR ONEGEOLOGY - GetFeatureInfo

ROU JGR 1:1M Bedrock Lithostratigraphy for Romania

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WMS IN GEOPORTAL - IGR
WMS SERVICES FOR TOPOGRAPHICAL MAPS (1:100.000 AND 1:25.000)
ARCGIS ONLINE – SPATIAL DATA AS SERVICES IN CLOUDING

Esri Maps and Data

The Esri Maps and Data group provides access to online basemap and reference map services, map layers and documents, and tools to use in your GIS work.

Group Content

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<th>World Imagery</th>
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<td>This map service presents satellite imagery for the world and high-resolution imagery for the United States and other areas around the world.</td>
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<td>Map Service by esri</td>
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<td>World Hydro Reference Overlay with World Terrain Base</td>
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<tr>
<td>Web Map by HydroTeamRC</td>
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<td>Rating: 4.5 (0 ratings, 1 comment, 2,693 views)</td>
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<table>
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<td>The World Hydro Reference Overlay Map service is designed to be used as a base map by scientists, professionals, and researchers in the fields of Hydrology, Geography, Climate, Soils, and other natural sciences.</td>
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ARCGIS ONLINE – SPATIAL DATA AS SERVICES IN CLOUDING
SPATIAL DATA FROM WMS SERVICES AND ARCGIS ONLINE
CONCLUSIONS

• The specification was developed and first published by the Open Geospatial Consortium (OGC) in 1999
• Standards and procedures for the use of distributed spatial data from distributed data sources over the internet
• Generate maps with the exchange of shared services from different sources and different software systems
• Original vector data are not accessible and are updated by data owner
THANK YOU FOR YOUR ATTENTION!

GEORGE TUDOR
geo_tudor@yahoo.com